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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/039,290	01/04/2002	Ali Shakouri	UC01-161-2	8342
8156	7590	09/08/2005	EXAMINER	
JOHN P. O'BANION O'BANION & RITCHEY LLP 400 CAPITOL MALL SUITE 1550 SACRAMENTO, CA 95814			SUNG, CHRISTINE	
			ART UNIT	PAPER NUMBER
			2878	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/039,290

Applicant(s)

SHAKOURI ET AL.

Examiner

Christine Sung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 and 40-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-31 and 40-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 03/02.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

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Response to Amendment

1. The amendment filed on June 6, 2005 has been entered.

Claim Objections

2. Claims objected to because of the following informalities: Claim 1 recites the limitation "said illumination detector" in line 8 of the claim. There is insufficient antecedent basis for this limitation in the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. Claims 2 and 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. The term "small thermo reflectance," in claims 2 and 23, is a relative term which renders the claim indefinite. The term "small thermo reflectance" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless —,

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-12, 17, 19, 21, 23-26, 40, 42 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Hutchinson (US Patent 5,751,830 A).

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Regarding claim 1, Hutchinson discloses an apparatus (Figure 7) for providing non-contact thermal measurements at high spatial and thermal resolutions (column 6, lines 55-59), comprising:

An illumination source (Figure 7, element 204);

Means for generating a signal in response to registration of the magnitude of light received from said illumination source that is reflected from the surface of an object or a detector (figure 7, element 20) ; and

Means for generating a bandwidth limited AC component of the signal from the illumination detector while said object is subjected to modulated thermal excitation (Column 9, line 52- column 10, line 10).

Regarding claim 2, Hutchinson discloses an apparatus for providing non-contact thermal measurements at high spatial and thermal resolutions comprising:

An illumination source (Figure 7, element 204);

An array of individual illumination detectors (figure 7, element 20);

Said illumination detectors (element 20) configured to generate signals in response to registration of the magnitude of light received from said illumination source that is reflected (column 5, lines 35-55) from the surface of an object (element 206); and

A signal processor or camera (element 12 and column 1, lines 12-16);

Said signal processor configured to filter one or more direct current components from said signal while said object is subjected to modulated thermal excitation to discern thermorefectance signal from noise (column 9, line 52- column 10, line 10).

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Regarding claims 3-4, Hutchinson discloses an array of individual illumination detectors (figure 7, element 20);

Said illumination detectors (element 20) configured to generate signals in response to registration of the magnitude of light received from said illumination source (column 5, lines 35-55).

Regarding claim 5, Hutchinson discloses an apparatus further comprising a display that is adapted for displaying the bandwidth limited AC component of the signal (column 3, lines 40-48).

Regarding claim 6, Hutchinson further discloses an apparatus comprising a means for receiving a bandwidth limited AC component of the signal and computing a thermal measurement based on a change in registered surface reflectance (column 3, line 49- column 4, line 9).

Regarding claim 7, Hutchinson discloses an apparatus and further discloses that the object (element 206) has a known thermorefectance constant (provided by the oscillating laser, element 204); and

Wherein the change in reflectance is in response to a change in the thermorefectance coefficient of the surface material (caused by the radiation provided by the laser, element 204) of the object resulting from a temperature change (claim 30) associated with said thermal excitation.

Regarding claim 8, Hutchinson discloses using a reference radiation or laser and superimposing the natural radiation from the object to produce an image of the scene (claim 9). The lower resolution images are resultant from the reference radiation and the natural radiation

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and the image produced of the scene has greater resolution as combines the data from both images to create a more accurate image of the scene.

Regarding claim 9, Hutchinson discloses the limitations set forth in claim 8, and further discloses the means for generating a superresolution image comprises:

A computer or processor (element 12 and column 1, lines 12-16);

And a means for receiving a plurality of thermal images (reference and natural radiation images) having a first image resolution; and combining the thermal images having the first resolution by interpolating pixel values into a thermal image having a higher resolution (claim 9).

Regarding claim 10, Hutchinson discloses that the illumination source is a laser light source (figure 7, element 204).

Regarding claims 11-12, Hutchinson discloses that the illumination laser light source is an IR source (see claim 30). Hutchinson further specifies that the laser is tunable to a desired wavelength/frequency (see column 9, lines 23-27). IR radiation is defined as radiation between 700 nm –1000nm. It is inherent that since Hutchinson discloses using a laser light that it would include the claimed wavelengths as it is within the defined IR range.

Regarding claim 17, Hutchinson discloses that the beam spot size (element 18) is smaller than the spatial resolution (see figure 7, element 18 and 20).

Regarding claim 19, Hutchinson discloses that the illumination detector is a photodetector or photodiode (abstract).

Regarding claim 21, Hutchinson discloses a 10x10 array of illumination detectors (Column 5, lines 40-44).

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Regarding claim 23, Hutchinson discloses an apparatus as disclosed in claim 1, and further discloses a signal processor or camera (element 12 and column 1, lines 12-16);

Said signal processor configured to filter one or more direct current components from said signal while said object is subjected to modulated thermal excitation to discern thermorefectance signal from noise (column 9, line 52- column 10, line 10).

Regarding claim 24, Hutchinson discloses that the signal processor is a lock-in amplifier (see figure 8 element 318 and column 9, lines 63-66).

Regarding claims 25-26, Hutchinson discloses that the signal processor filters out components other than the desired irradiation frequency (column 9, line 56- column 10, line 10).

Regarding claim 40, Hutchinson discloses a method for providing high-resolution thermal imaging of an object being subjected to thermal modulation comprising:

Illuminating (figure 7, element 204) an area on the surface of an object (element 206) for which thermal information is desired;

Detecting (element 20) illumination reflected from said area; and

Generating an AC coupled bandwidth-limited signal in response to detected illumination (Column 9, line 52- column 10, line 10).

Regarding claim 42, Hutchinson further discloses resolving the AC coupled signal into an image (abstract).

Regarding claim 43, Hutchinson discloses a method for providing a high resolution thermal imaging of an object being subjected to thermal modulation, comprising:

Illuminating (figure 7, element 204) an area on the surface of an object (element 206) for which thermal information is desired;

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Detecting (element 20) illumination reflected from said area;

Generating an AC coupled bandwidth limited signal in response to detected illumination
(Column 9, line 52-column 10, line 10); and

Resolving the AC coupled signal into an image (abstract).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 13-15, 20, 22, 27-29, 41 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hutchinson (US Patent 5,751,830 A).

Regarding claims 13-14, Hutchinson discloses a laser light but does not specify the power range of the laser. However, Hutchinson discloses that the laser is tunable (see column 9, lines 23-27). The laser power is determined by the wavelength of radiation and the materials used in

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the laser to produce the radiation, and that once the wavelength has been determined the power required would be a function of the wavelength.

Regarding claim 15, Hutchinson discloses the limitations set forth in claims 1 and 2, but does not specify an x-y translation stage for providing a means for scanning the thermal image. Hutchinson teaches away from such scanning as it is not necessary for his invention, but does disclose that scanning has been done in prior art references. At the time the invention was made, one of ordinary skill in the art would be motivated to use a scanning means to acquire the thermal image in order to increase spatial resolution.

Regarding claim 20, Hutchinson discloses a 10x10 array of photodetectors and further discloses that the increasing the number of array elements increases the image resolution (column 5, lines 40-44). Although Hutchinson does not specify an array ranging between 16x16 and 64x64, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to have increased the number of array elements in order to increase the image resolution.

Regarding claim 22, 27-29, 41 and 44, Hutchinson discloses filtering out frequencies using a filter (abstract), but does not specify the exact frequencies. Determining the band of frequencies to filter is a result effective variable, as once the range in which the desired radiation has been determined, all other frequencies should be filtered in order to reduce the amount of erroneous data collected and processed. Therefore, once the desired frequency is determined from the incident radiation source or other defining parameters, the filter bandwidth can be determined.

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10. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hutchinson (US Patent 5,751,830 A) in view of Dentinger (US Patent 6,166,384 A)

Regarding claim 18, Hutchinson discloses the limitation set forth in claim 17, but does not specify an inverse filter for removing image blurring caused by an excessively large illumination spot. However, Dentinger discloses a conventional imager that uses an inverse filter to remove image blurring (column 3, line 56- column 4, line 5). One of ordinary skill in the art would be motivated to use the inverse filter as disclosed by Hutchinson in order to decrease image blurring.

11. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hutchinson (US Patent 5,751,830 A) in view of Adams (US Patent 5,199,054 A).

Regarding claim 16, Hutchinson discloses the limitations set forth in claim 15 but does not specify a piezoelectric translation stage and that the stage provides movement equal to or higher than the desired spatial resolution. Piezoelectric translations stages are well known in the imaging art, as demonstrated by Adams (column 3, lines 20-24), further it would be obvious to match or exceed the resolution of the image using the stage. One of ordinary skill in the art would be motivated to use the piezoelectric translation stage as disclosed by Hutchinson with the invention as disclosed by Adams in order to increase the accuracy of the scan and ensure the resolution is comparable to the desired resolution.

12. Claims 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hutchinson (US Patent 5,751,830 A) in view of Messina (US Patent 6,288,381 A).

Regarding claims 30 and 31, the limitations set forth in claims 1 and 2 have been disclosed in the aforementioned paragraphs. Hutchinson does not specify an imaging device that

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receives the reflecting radiation to align the source in relation to the object. However, source alignment or detector alignment is well known in the art, as demonstrated by Messina (column 5, lines 1-13). One of ordinary skill in the art would be motivated to use the detector/source alignment apparatus as disclosed by Messina with the invention as disclosed by Hutchinson in order to increase the accuracy of the detected radiation by ensuring proper alignment of the detector/source with relation to the object.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. 6,175,113- this reference discloses a thermal imaging system

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christine Sung whose telephone number is 571-272-2448. The examiner can normally be reached on Monday- Friday 7-3 pm.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Christine Sung
Examiner
Art Unit 2878

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